Virtual Goat

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Partners and collaborations

Ghent University (UGent)

SCOPE OF THE METHOD

The Method relates to	Animal health
The Method is situated in	Translational - Applied Research
Type of method	In silico
Species from which cells/tissues/organs are derived	Capra aegagrus hircus
Type of cells/tissues/organs	Muscle, fat, intestines' content and tissue, bone

DESCRIPTION

Method keywords

computational models
in silico analysis

Scientific area keywords

electromagnetic simulations
Antenna Design
computational modelling

Method description

Full-wave electromagnetic (EM) simulations solve the laws of Maxwell for a given problem. When designing a wireless solution for an Internet of Animal Health (IoAH) application, multiple iterations are needed to achieve well-defined metrics such as energy efficiency, electrical and mechanical robustness against environmental changes and reproducibility. When considering in-body devices, the surrounding tissue will electromagnetically couple with the radiating in-body antenna. Therefore, to optimize the antenna, the body of the animal and its electromagnetic properties must be well characterized and digitalized. The characterization is done by measuring the electrical permittivity and permeability of bulk tissue (Gabriel, 1996). To construct the heterogeneous model of the animal, a slaughtered animal was measured and expertly drawn in computer aided design (CAD) software. This model of the animal, together with the measured tissue properties, can be imported in the full-wave electromagnetic solver. In this *in silico* environment, multiple iterations and placements can be tried out at a low cost and without any extra test animals. Once the above defined metrics are achieved, only validation tests are left to be performed on test animals.

Lab equipment

Electromagnetic solvers (CST, Sim4Life, COMSOL, HFSS,...)
Computation cluster

Method status

Internally validated

PROS, CONS & FUTURE POTENTIAL

Advantages

- Cost reduction
- Reduction *in-vivo* and *in-vitro* experiments
- Improved understanding of underlying mechanisms
- Generalization of the results by digitally varying the model

Challenges

- Validation of model assumptions / predictions / results still required a small set of test animals;
- Simplified body model can have unforeseen consequences.

Modifications

The current method is described for goats. It can easily be extended to other animals.

Future & Other applications

With the increased interest in automatic farming and IoAH, the demand for wireless in-body development will increase. This method will decrease significantly the need of test animals in the coming decade during the maturing of this technology.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

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